Small Business Innovation Research/Small Business Tech Transfer

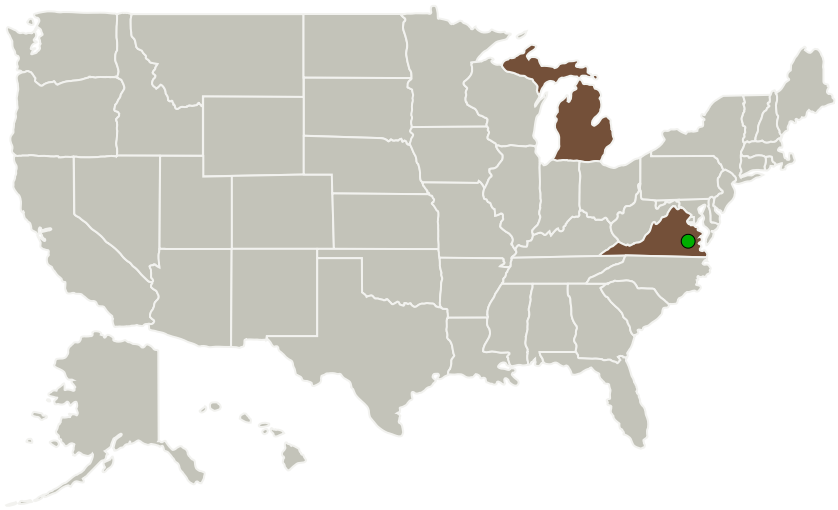
Ultrasonic Additive Manufacturing for Efficient Space Vehicles, Phase I

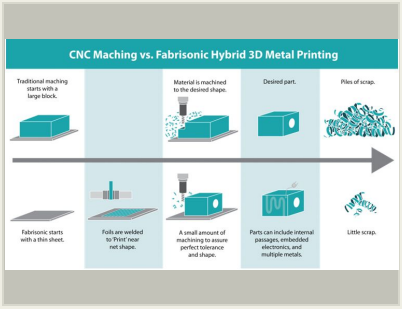
Completed Technology Project (2015 - 2015)

Project Introduction

The goal of this Phase I SBIR program is to demonstrate the use of Ultrasonic Additive Manufacturing (UAM) solid state metal 3D printing to create new and innovative materials that enable Space Launch System structures with superior mechanical properties and increased reliability, and validate these advancements with third party testing. Specifically, this effort will demonstrate technical feasibility and test proof of concept for: 1. 3D printing of dissimilar high temperature metals such as Inconel and steel in novel designs 2. Creation of gradient materials for multipurpose structures 3. 3D printing of metal matrix composites for selective reinforcement and lightweighting The UAM process has been refined to achieve high technology readiness levels in aluminum, copper, stainless steel, and titanium, and combinations of these materials. The extension of the UAM process to dissimilar combinations with Inconel, gradient materials, and metal matrix composites is challenging. Successful proof of concept of these innovations and elevation of one specific application to TRL 4, validated by third party testing, will be accomplished in Phase I. With NASA guidance, the project team Phase II plan is to select and develop functional prototypes of Space Launch System structures with the most successful Phase I results to illustrate efficient space vehicle concepts. A demonstration unit will be delivered to NASA for testing at the completion of the Phase II contract.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Sheridan Solutions, LLC	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Saline, Michigan
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Michigan	Virginia

Project Transitions

June 2015: Project Start

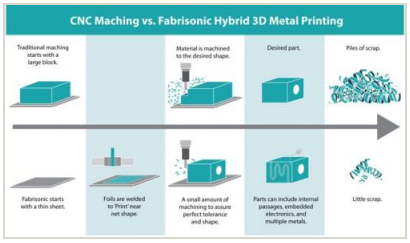
December 2015: Closed out

Closeout Summary: Ultrasonic Additive Manufacturing for Efficient Space Vehicles, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139405)*

Images



Briefing Chart Image
Ultrasonic Additive Manufacturing for Efficient Space Vehicles, Phase I *(https://techport.nasa.gov/image/132054)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Sheridan Solutions, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
John J Sheridan

Co-Investigator:
John T Sheridan

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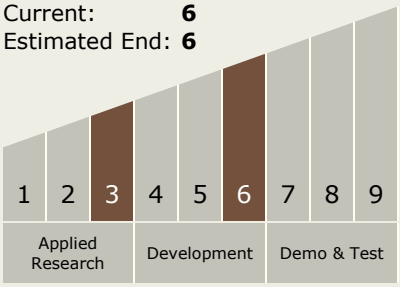
Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.5 Innovative, Multifunctional Concepts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System